

HOMEWORK ASSIGNMENT 8 (PRACTICE)

CO19-320322: COMPUTER GRAPHICS
320322: GRAPHICS AND VISUALIZATION

Fall 2016

Prof. Dr. Lars Linsen
Jacobs University

Due: Friday, November 18, 2016, at 8pm.

Problem 8: Illumination & Shading (6+7+12=25 points + up to 15 bonus points)

In this assignment, you will compare different illumination and shading options using the raster graphics pipeline (OpenGL) and your ray caster of Problem 4.

- (a) *OpenGL rendering.* Render a sphere in OpenGL (with depth buffering) using material properties and multiple point light sources (of different properties) for illumination.
- (b) *OpenGL interaction.* Allow for switching between flat and smooth shading, where the normals of the sphere shall be provided explicitly for smooth shading. Also, allow for interactively switching on and off different light sources and changing the material properties (ambient, diffuse, and specular reflection coefficient as well as specular reflection exponent). What can you observe?
- (c) *Ray Casting rendering.* Render the same scene as in (a) using your ray caster, where the sphere can be given implicitly as in Problem 4. The surface normals are computed at the ray-sphere intersection points. This requires you to implement the Blinn-Phong illumination model. How does your result compare to the result in (a)?
- (d) *Bonus.* Perform steps (a), (b), and (c) for arbitrary triangular meshes in OBJ format (see Problem 6). Use the normals that are provided. For the OpenGL rendering use the built-in Gouraud shading, while for the ray casting rendering you shall implement Phong shading. What can you observe?

Remarks: Solutions for the practical part have to be handed in via jGrader (<https://cantaloupe.eecs.jacobs-university.de/login.php>) by the due date. For late submissions you need to get in contact with the TA directly. You need to upload one zip-file that contains all source files (no executables or object files) for the programming assignments.